

What is claimed is:

1. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;  
cleaning a surface of a semiconductor film; and  
applying a laser beam to said semiconductor film to form a crystalline semiconductor film in a nitrogen atmosphere.

2. A method according to claim 1, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

3. A method according to claim 1, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

4. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;  
cleaning a surface of said semiconductor film;  
preheating said semiconductor film; and

applying a laser beam to said semiconductor film to form a crystalline semiconductor film in a nitrogen atmosphere.

5. A method according to claim 4, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

6. A method according to claim 4, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

7. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;

cleaning a surface of said semiconductor film;

preheating said semiconductor film in an atmosphere containing oxygen and nitrogen; and

applying a laser beam to said semiconductor film to form a crystalline semiconductor film in a nitrogen atmosphere.

8. A method according to claim 7, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

9. A method according to claim 7, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

10. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;  
cleaning a surface of said semiconductor film;  
preheating said semiconductor film to form an oxide film on a surface of said semiconductor film; and  
applying a laser beam to said semiconductor film to form a crystalline semiconductor film in a nitrogen atmosphere.

11. A method according to claim 10, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

12. A method according to claim 10, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

13. A method for manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film over a substrate;

cleaning a surface of said crystalline semiconductor film; and

applying a laser beam to said crystalline semiconductor film to improve crystallinity of said crystalline semiconductor film in a nitrogen atmosphere.

14. A method according to claim 13, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

15. A method according to claim 13, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

16. A method for manufacturing a semiconductor device comprising the steps of:

forming a crystalline semiconductor film over a substrate;

cleaning a surface of said crystalline semiconductor film;

preheating said crystalline semiconductor film; and

applying a laser beam to said crystalline semiconductor film to improve crystallinity of said crystalline semiconductor film in a nitrogen atmosphere.

17. A method according to claim 16, wherein said cleaning is performed by using HF aqueous solution or an aqueous solution containing HF and H<sub>2</sub>O<sub>2</sub>.

18. A method according to claim 16, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

19. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;

cleaning a surface of said semiconductor film;

forming an oxide film on a surface of said semiconductor film; and

applying a laser beam to said semiconductor film to form a crystalline semiconductor film in the air.

20. A method according to claim 19, wherein said laser beam is a linear laser beam.

21. A method according to claim 19, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

22. A method according to claim 19, wherein said oxide film has a thickness of 20-40Å.

23. A method for manufacturing a semiconductor device comprising the steps of:

forming a semiconductor film over a substrate;

cleaning a surface of said semiconductor film by using HF aqueous solution or an aqueous solution containing HF and  $H_2O_2$ ;

forming an oxide film on a surface of said semiconductor film; and

applying a laser beam to said semiconductor film to form a crystalline semiconductor film in the air.

24. A method according to claim 23, wherein said laser beam is a linear laser beam.

25. A method according to claim 23, wherein said laser beam has an energy density of 100 to 500 mJ/cm<sup>2</sup>.

26. A method according to claim 23, wherein said oxide film has a thickness of 20-40Å.